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IS 3972-1-1 (1982): Methods of test for vitreous enamelware, Part 1: Production of specimens for testing, Section 1: Enameled sheet steel [CHD 9: Ceramicware]

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**IS : 3972 ( Part 1/Sec 1 ) - 1982**

*Indian Standard*

**METHODS OF TEST FOR  
VITREOUS ENAMELWARE**

**PART 1 PRODUCTION OF SPECIMENS FOR TESTING**

Section 1 Enamelled Sheet Steel

*( First Revision )*

UDC 666.293.12.620.115



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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

**Gr 2**

***June 1983***

**AMENDMENT NO. 1 JANUARY 2006**  
**TO**  
**IS 3972 ( PART 1/SEC 1 ) : 1982 METHODS OF TEST**  
**FOR VITREOUS ENAMELWARE**

**PART 1 PRODUCTION OF SPECIMENS FOR TESTING**

**Section 1 Enamelled Sheet Steel**

*( First Revision )*

*( Page 5, clause 4.3.1, line 4 )— Substitute '[ see IS 3972 ( Part 2/Sec 2 ) : 1985\*' for '[ see IS : 3972 ( Part II )\*' ].*

*( Page 5, footnote marked '\*' )— Substitute the following for the existing:*

'\*Methods of test for vitreous enamelware : Part 2 Test methods. Section 2 Low and high voltage tests for detecting and locating defects (*first revision*).'

**( CHD 9 )**

## *Indian Standard*

# METHODS OF TEST FOR VITREOUS ENAMELWARE

## PART I PRODUCTION OF SPECIMENS FOR TESTING

### Section I Enamelled Sheet Steel

( *First Revision* )

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## *Indian Standard*

# METHODS OF TEST FOR VITREOUS ENAMELWARE

## PART I PRODUCTION OF SPECIMENS FOR TESTING

### Section I Enamelled Sheet Steel

( *First Revision* )

## 0. FOREWORD

**0.1** This Indian Standard (Part I) was adopted by the Indian Standards Institution on 27 December 1982, after the draft finalized by the Ceramic-ware Sectional Committee had been approved by the Chemical Division Council.

**0.2** This standard was first issued in 1968. However, keeping in view the experience gained during the years and various International Standards brought out by the International Organization for Standardization (ISO) on the subject of testing vitreous enamels and enamelware, the Committee responsible for the preparation of this standard decided to revise it with a view to updating the existing methods of test and by incorporating those not covered earlier. The revised standard now comprises of two parts. Part I covers the production of specimen for testing enamelled sheet steel and cast iron, and Part II will cover various test methods. The Committee also decided to prepare a separate standard to deal with enamelled cast iron.

**0.3** For testing both vitreous enamels and enamelware, either whole articles may be taken as specimen or portions may be cut out of them as specimens. Where this is not possible or when the loss in mass per unit area of the enamel coating is to be determined quantitatively, specimens may have to be prepared specially (*see 4*) as the specimens cut from enamelled articles (*see 5*) may reduce the accuracy. Accordingly, in this standard ( Part I ) details have been given for the production of specially prepared specimens and also for cutting specimens for production articles.

**0.4** In the preparation of this standard assistance has been derived from ISO 2723-1973 'Vitreous and porcelain enamels for sheet steel-production of specimens for testing', issued by the International Organization for Standardization (ISO).

## 1. SCOPE

**1.1** This standard ( Part I ) specifies methods for the production of specimens suitable for testing vitreous enamels for sheet steel and enamelled sheet steel articles.

## 2. TERMINOLOGY

**2.1** For the purpose of this standard the definitions given in IS : 2717-1979\* shall apply.

## 3. SHAPE AND DIMENSIONS OF SPECIMENS

**3.1** The specimens shall be flat, enamelled, circular, square or rectangular plate of steel sheet of a suitable diameter or side length or as required in specific test method not exceeding 110 mm.

**NOTE** — According to the carrying capacity of the commonly used analytical balances and with regard to the required weighing accuracy, the mass of the specimens prepared should, in principle, not exceed 200 g. Specimens exceeding 200 g may require special weighing equipment, otherwise the degree of accuracy may be impaired.

## 4. PRODUCTION OF SPECIALITY PREPARED SPECIMENS

**4.1 Materials** — The sheet steel, upon which enamel is applied, shall be of low carbon quality, having carbon content (as C) not exceeding 0.08 percent by mass. The enamelling quality steel is preferable for the purpose, but in absence of it cold rolled closed annealed type of steel may be used.

**NOTE** — It may be preferable to hang the specimens during weighing and enamelling; for this purpose a hole of approximately 2.5 mm diameter with its centre 3 mm from the edge of the test plate may be provided in the specimen.

### 4.2 Procedure

**4.2.1 Regular Enamels for Sheet Steel** — Prepare the metal for enamelling by any one of the recognized procedures, but use the same procedure and materials for preparing specimens for comparison.

**4.2.1.1** Apply ground coat by dipping, or spraying, on both sides of the specimen so that an agreed thickness of coating is obtained.

**4.2.1.2** After drying, fusing and cooling of the specimen, apply the cover coat on to one side only. For ensuring that there is a minimum of build-up around the edge of the specimen, suitably wipe the applied enamel from the edges to a width of 2 or 3 mm after drying and then fuse.

**NOTE** — For most purposes one cover coat is standard procedure, but in cases where two or three cover coats are considered to be usual practice, the additional coats shall be applied.

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\*Glossary of terms relating to vitreous enamelware and ceramic-metal systems (*first revision* ).

**4.2.1.3** If by the enamelling of two cover coats, a smooth or defect-free surface is not obtained (*see 4.3*), reject the specimens. However, in the case of enamels for containers and apparatus to be used in the chemical industry, a third or even more layers of cover coat may be applied and fired; keeping the coating thickness on the edge as thin as possible.

**4.2.1.4** Coating thicknesses may vary, but specimens for comparison shall be of the same thickness.

**4.2.2 Direct-on Enamels for Sheet Steel** — Prepare the metal surface as required for this process.

**4.2.2.1** Apply the enamel on one or both side of the specimen or as required for any particular test.

**NOTE** — When application of one coat is the usual practice, apply one coat only. In cases where additional coating are a necessary part of the finish, these coatings shall be applied accordingly.

**4.2.2.2** Coating thickness may vary but specimens for comparison shall be of the same thickness.

**4.3 Quality of Surface Finish of Enamelled Specimen** — The surface of the enamelled specimens shall be flat and free from defects.

**4.3.1** The specimens shall be checked by visual inspection for freedom from defects. However, the specimens for enamels for containers and apparatus for the chemical industry shall be checked with high voltage for freedom from weak places and pinholes [*see IS:3972 ( Part II )\**]. The voltage to be used for the test shall be as agreed to between the interested parties.

## 5. SPECIMENS FROM PRODUCTION ARTICLES

**5.0 General** — Specimen shall be taken only from flat area of the enamelled articles. If the loss in mass per unit area of the enamel coating is to be determined quantitatively, the specimens shall be taken from those flat areas where the reverse side is protected by at least a ground or direct-on enamel coat as the case may be.

**5.1 Procedure** — Before cutting off the specimens, remove the enamel along the cutting surfaces on both sides of the metal by grinding, the width of the zone from which enamel is to be removed being determined by the width of the cutting tool and an extra margin of 2 mm for safety.

**NOTE** — Grinding machines are suitable for grinding off the enamel, where silicon carbide stones, corundum and diamond stones are applied.

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\*Methods of test for vitreous enamelled sheet steel : Part II (*under preparation* ).

**I N D I A N      S T A N D A R D S**  
**ON**  
**CERAMICWARE**

IS:

- 2333-1981 Plaster of paris for ceramic industry (*first revision*)  
2717-1964 Glossary of terms used in vitreous enamelware industry  
2781-1975 Glossary of terms relating to ceramicware (*first revision*)  
2836-1974 Methods of test and quality requirements for porcelain laboratory apparatus (*first revision*)  
2837 ( Part I )-1975 Porcelain crucibles and basins: Part I Crucibles  
2837 ( Part II )-1977 Porcelain crucibles and basins: Part II Basins  
2838-1964 Stoneware containers for general purposes  
2839-1964 Industrial stoneware  
2840-1965 Chinaclay for ceramic industry  
2857-1976 Earthenware dinnerware (*first revision*)  
3149-1968 Enamel ware for home use (*first revision*)  
3432-1965 Clay pipe triangles  
3505-1979 Porcelain dinnerware (*first revision*)  
3972-1968 Methods of test for vitreous enamelware  
4589-1968 Ball clays for ceramic industry  
6988-1973 Fine china dinnerware  
7087-1973 Ceramic tower packings  
7402 ( Part I )-1974 Ceramic water filters: Part I Filter containers  
7402 ( Part II )-1975 Ceramic water filters: Part II Filter candles  
7775-1975 Ceramic grinding media and lining  
8017-1976 Vitreous enamelled reflectors for use with tungsten filament lamps  
8687 ( Part I )-1977 Methods of test for vitreous enamels and frits: Part I Sieve analysis  
8687 ( Part II )-1977 Methods of test for vitreous enamels and frits: Part II Fusion flow test  
8709-1977 Methods of test for vitreous enamel coatings, colour retention  
9749-1981 Potash feldspar for glass and pottery

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